United States Patent

Liloia et al.

[15] **3,663,348**

[45] **May 16, 1972**

[54] **LOFTY AND SOFT NONWOVEN, THROUGH BONDED FABRIC**

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[22] Filed: **May 16, 1968**

[21] Appl. No.: **729,784**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 515,874, Dec. 23, 1965, abandoned.

[52] U.S. Cl. **161/116**, 128/284, 161/164, 161/170

[51] Int. Cl. **A61f 13/18**, B32b 5/16, D04h 1/12

[58] Field of Search 161/116, 151, 155, 164, 169, 161/170, 162

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[57] **ABSTRACT**

An improved lightweight fabric formed predominantly of short-length cellulosic fibers with a minor percentage of long fibers in a substantially homogeneous non-woven web, improved products such as a diaper made therefrom and improved methods of manufacture.

14 Claims, 9 Drawing Figures

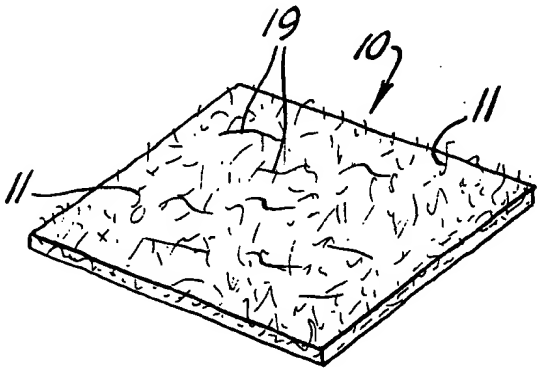

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Fig. 1.

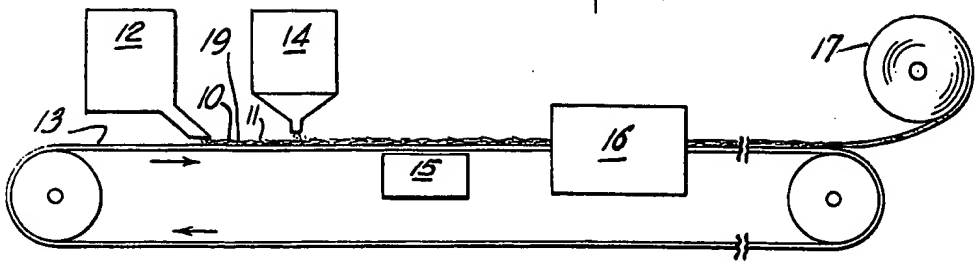


Fig. 2.

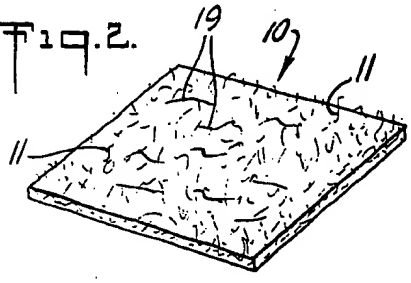


Fig. 3.

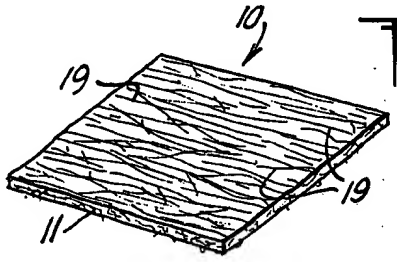


Fig. 4.

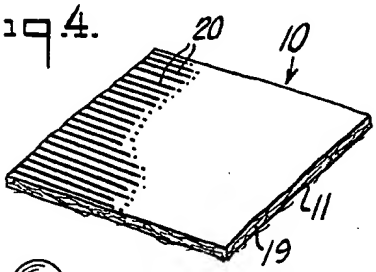
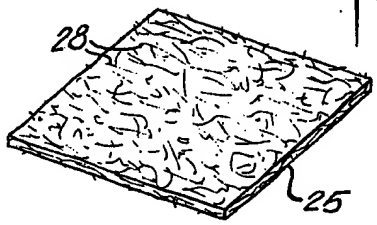


Fig. 6.



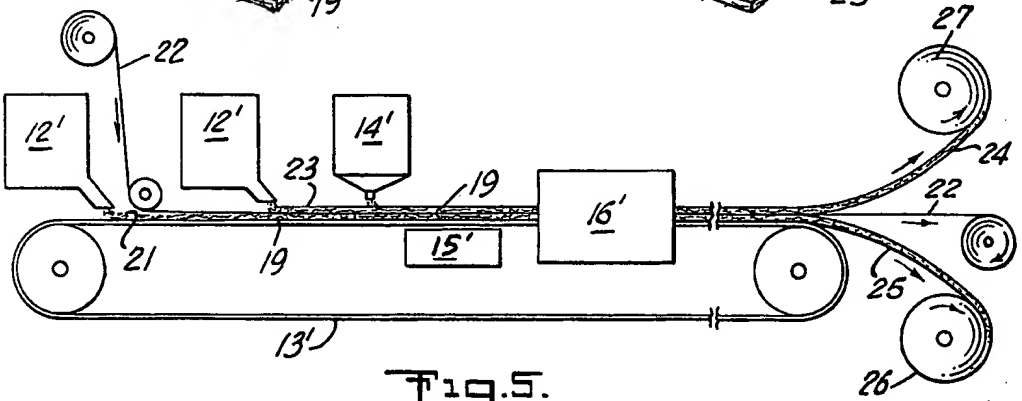


Fig. 5.

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Fig. 7.

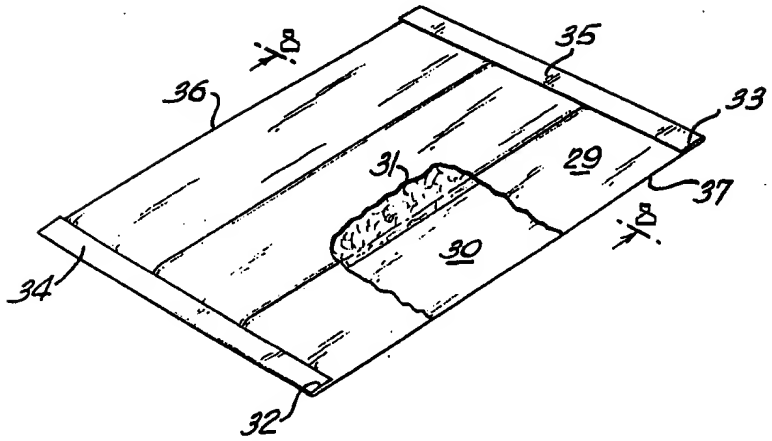


Fig. 8.

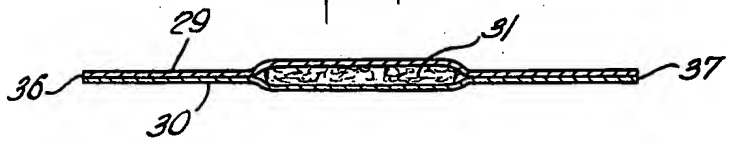
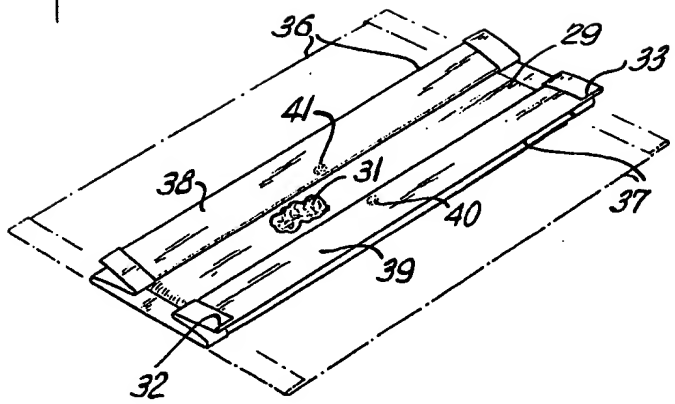


Fig. 9.



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LOFTY AND SOFT NONWOVEN, THROUGH BONDED FABRIC

This is a continuation-in-part of our copending application Ser. No. 515,874, filed Dec. 23, 1965 and now abandoned.

The present invention relates to fabrics formed predominantly of short-length cellulosic fibers, the method of making the same, and products formed therefrom.

Because of the cost savings that can be realized by using short-length fibers, such as the fibers of wood pulp or cotton linters, it has been a desideratum in the manufacture of fabrics and fabric-like materials to use such fibers as compared to the longer fibers of one-half inch or more in length generally used. The preparation of fabrics and fabric-like materials has, however, heretofore been limited to the use of at least a very substantial percentage of these longer fibers, generally referred to in the trade as textile-length fibers, and to relatively heavy fabrics because of the inability heretofore to make, from the shorter-length fiber, products having the strength, light weight drape and softness and feed characteristics generally associated with fabrics formed of such longer-length fibers.

Paper, absorbent wadding, and the like have been made from the shorter-length cellulosic fibers. Papers, formed by the conventional paper making processes wherein the fibers are assembled in a wet slurry and wherein the fibers are held together through a hydrogen bond, are relatively stiff dense products lacking the highly desirable characteristics heretofore referred to. Wood pulp fibers, and the like, have been gathered together in a low density bulk mass, wherein the fibers have relatively few or no hydrogen bonds holding the same together, to form highly absorbent bulk materials. Wood pulp fibers also have been formed into sheet-like materials of relatively low density wherein the fibers are partially bonded together, the same being referred to as cellulose wadding. However, these sheets of cellulose wadding are quite fragile, having extremely low wet and dry strengths and are completely unsuitable as a substitute for textile materials. Accordingly, where fabric-like materials have heretofore been made by processes other than weaving, such, for example, as felting or fiber-laying with bonding, the same have been made entirely of textile-length fibers or of a mixture of fibers comprising predominantly textile-length fibers or a substantial percentage of textile-length fibers in a relatively heavy fabric.

In accordance with the present invention, fabric-like materials are prepared predominantly of fibers having a length of less than one-quarter inch and in many instances, as hereinafter more fully described, formed almost entirely of such shorter-length fibers.

With the growing demand for disposable articles, there has been an increasing demand for fabric-like materials which avoid the expense and processing of woven fabrics. As a result there has been an increasing demand for and production of nonwoven fabrics. However, the cost can still be further reduced with equivalent or enhanced physical characteristics where the fabric-like materials are made using predominantly the less expensive short-length fibers such as wood pulp fibers and second cut cotton linters processed in accordance with this invention.

It is an object of the present invention to prepare lightweight fabrics and fabric-like materials having a good hand or feel, loft, softness, elongation, drapability and strength from predominantly short-length cellulosic fibers.

It is another object of this invention to provide such lightweight fabrics or fabric-like materials from predominantly short-length fibers where the longer fibers are relatively long and uniform to provide an interconnecting and strength giving network for the short fibers.

A still further object is to prepare disposable diapers and the like made predominantly from short-length fibers.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings which set forth by way of illustration and example certain embodiments thereof.

IN THE DRAWINGS:

FIG. 1 is a schematic view showing the preparation of a fabric of the present invention;

FIG. 2 is a perspective view illustrating a swatch of fabric of the present invention;

FIG. 3 is a perspective view illustrating a modification of the fabric of the present invention;

FIG. 4 is a perspective view illustrating a further modification of the fabric of the present invention;

FIG. 5 is a schematic view showing the preparation of fabric of the present invention in a manner to produce a modified fabric;

FIG. 6 is a perspective view illustrating a swatch of fabric prepared in the manner of FIG. 5;

FIG. 7 is a perspective view of a diaper of the present invention;

FIG. 8 is a cross-sectional view taken along lines 8—8 of FIG. 7; and

FIG. 9 is an illustration of the diaper of FIG. 7 in a prefolded state.

The fabrics of the present invention have a fiber content which is predominantly short fibers. By way of definition, "short fibers," as used herein, means wood pulp, cotton linters or the like where the fiber lengths are less than one-quarter inch in length. Between 75 and 98 percent of the total fiber content in the fabrics of this invention are such short fibers. Both wood pulp and cotton linters are substantially less expensive than the textile-length cellulosic fibers of cotton and rayon generally employed in making both woven and nonwoven cellulosic fabrics. In the preferred embodiments, the wood pulp fibers and the second cut cotton linters generally have a length not exceeding about one-quarter inch with the average length being from about one-sixteenth to three-sixteenth inch. Accordingly, the fabrics of the present invention have a fiber content in which between 75 and 98 percent of the fibers are less than one-quarter inch in length.

"Textile length fibers" or "long fibers" in this specification means fibers at least three-fourths inch in length, and in the preferred forms of the invention the long fibers are all of substantially the same length, preferably produced synthetically and preferably at least 1 inch long. In one preferred embodiment made in accordance with Example I, 1.5 denier rayon long fibers were used which were uniformly cut to about 1½ inch lengths and homogeneously and randomly dispersed with the short fibers. Surprisingly high tensile strengths are thereby attainable provided the short fibers are thoroughly and efficiently separated and the short and long fibers are carefully and thoroughly blended and intermixed.

The fabrics of the present invention have fabric weights in the rang of 1 to 8 oz./yd.^{2}; a density of less than 0.15 gram/c.c., the density generally being in the range of 0.100 gram/c.c. to 0.050 gram/c.c.; and for a fabric having a weight of about 1.5 oz./yd.^{2}, a dry strength of at least 0.15 pound/inch of width in machine direction and 0.10 pound/inch of width in the cross direction. The fabrics have unusually good elongation, loft, softness and drape characteristics when compared with prior products incorporating any substantial amount of short fibers.

The fabrics are prepared by first forming a web of randomly laid dry fibers, the web when laid having a density of about 0.09 gram/c.c. to 0.025 gram/c.c. measured by ASTM Method D–1777 at 0.16 pound/square inch (test procedure set forth in the manual of *The American Society for Testing Materials*). Where wood pulp fibers are used, the same are generally obtained in the form of a fiberboard of fairly dense construction from which the fibers must be separated. These wood pulp fibers generally have a fiber length ranging from a fine dust to about one-quarter inch.

Short-length fibers are best classified by the Clark Classification procedure described in the test manual of *The Technical Association of Pulp and Paper Industry* (TAPPI — T233 SU64). In this procedure a water slurry of the fibers is passed

through a series of graded screens. Using this technique, which avoids grinding the fibers, second cut cotton linters are found to have the following composition:

30% retained by a 12 mesh screen
22% retained by an 18 mesh screen
14% retained by a 30 mesh screen
16% retained by a 50 mesh screen
18% passed through 50 mesh screen

In making the short fiber fabrics of the present invention a web of dry fibers is first formed. In the preferred method of manufacture, the web is then impregnated with a binder by flowing a solution or dispersion of the binder through the web. The impregnated web is then subjected to suction to remove excess binder and assure uniform distribution of binder throughout the fiber web. This impregnation by binder followed by suction is hereinafter referred to as suction-bonding. The fiber web at this point has, in one embodiment on a solids basis, 4 to 6 percent dry solids add-on by weight of the web. Depending upon the strength requirements of the web, the loft and the softness desired in the end product, the range of dry solids added on may vary over the range of about 1 to about 30 percent. The web so formed is then dried and heated to cure the binder. This can be done simultaneously by passing into a drying oven heated to a temperature of about 310° to 320° F. where the same is dried and the binder cured. The preferred binders are of the self-curing acrylic latex family, the urethane family, or other binders which can be utilized in low viscosity solutions or suspensions.

This invention has especial advantages in the manufacture of lightweight, low density, lofty, and soft fabrics. The especially useful range of fabric densities in accordance with this invention is from about 0.05 gram/c.c. to about 0.15 gram/c.c. By the use of the teaching of this invention and the combination of fibers and parameters set forth herein, it was found possible to manufacture lightweight fabrics, that is, fabrics having weights of less than 8 ounces per square yard and handle the product, air blown or otherwise assembled dry, during further processing. Thereby unusually desirable weights, densities and other physical characteristics are obtained.

The preparation of predominantly short fiber fabrics in accordance with the present invention is illustrated schematically, for example, in FIG. 1. Referring to FIG. 1, a web 10 of mixed randomly disposed short fibers 11 and long fibers 19 are deposited from fiber-laying equipment 12 onto a foraminous moving screen or belt 13. The fiber-laying equipment 12 is preferably of the air deposition type such as a modified RANDO WEBBER made by The Curlator Co. The low density fiber web 10 is moved by belt 13 below a screen containing a weir box 14 of binder in solution or aqueous dispersion form. The binder fluid is flowed onto and through the web 10 in quantities substantially in excess of the ultimate amount to be deposited on the fibers completely impregnating the web. The web 10, immediately after impregnation with the binder solution, passes over a suction box 15 where excess binder is removed. The impregnated web 10 is conveyed by belt 13 through a dryer 16. The fabric is then removed from belt 13 and collected, for example, on fabric roll 17. A section of fabric so formed is illustrated, for example, in FIG. 2 of the drawings showing a very small percentage of long fibers 19. An alternate construction with a larger percentage of long fibers 19 is shown diagrammatically in FIG. 3. The binder should be of the low viscosity type to maintain the features of the invention described. A "low viscosity binder" is generally one having the desired adhesive qualities and a viscosity less than 5 centipoises.

The binder, in the preferred method of manufacture, is flowed onto the fabric from the weir box 14 and a major proportion thereof is withdrawn in the suction box 15 before the fabric enters the dryer 16. It is important in attaining the lofty and soft character of the fabrics made hereunder that the application, removal and drying of the binder be without substantial compression of the fabric. In many conventional methods of processing fabrics, excess binder liquids are squeezed out of the fabric with compression rollers or the like and such processes would generally produce unsatisfactory products when practicing this invention.

It has been found that the elongation characteristics are enhanced in fabrics made in accordance with this invention. One set of samples was constructed with about 2½ oz./yd.² of fiber weight and utilizing wood pulp as the short fibers and about 1½ inch 1.5 denier rayon staple as the long fibers. In the set, the percentage of long fibers was varied, and the elongation tests were performed on the unbonded web. Over the range of interest, the percentage of elongation varied from about 60 to 94 percent. The elongation was measured by stretching a sample of the fabric between two clamped ends and measuring the percentage increase in length before the two ends separated. This parameter is an indication of the usefulness of the fabric in many applications such as towel materials, cosmetic pads, and elsewhere where conventional tensile strength is not a singular criteria to be considered. When bonded, the samples were found to have comparable but somewhat lower elongation characteristics.

Based on the samples tested, a fabric made of 98 percent short fibers has about a 60 percent elongation, both in the machine direction and in the cross direction. Samples made of 85 percent short fibers with 15 percent long fibers exhibited an elongation of about 88 percent, and samples containing 75 percent short fibers showed an elongation of about 94 percent. It has been found that there is a substantial increase in elongation characteristics with the addition of about 2 percent of long fibers to an otherwise short fiber fabric. The percentage of elongation rises very rapidly with the addition of long fibers up to about 2 percent and continues to increase for increases in long fibers up to 10 percent at a diminishing rate. As the percentage of long fibers is increased from about 10 to about 25 percent, the elongation characteristics improve rather consistently and more gradually. However, it has been found that additional long fibers in excess of about 25 percent do not increase the elongation characteristics at the same rate and actually reduce the elongation in some cases. A sample made of 100 percent long fibers and no short fibers showed an elongation in both directions of approximately 60 percent and a sample made of 100 percent short fibers exhibited an elongation of 28 percent.

It is extremely difficult to handle a web of randomly disposed dry fibers of predominantly short fiber length in webs of 8 oz./yd.² or less through the bonding equipment and subsequently through the drying apparatus. In fact, handling of fabrics having weights of less than 2 oz./yd.² had been considered unworkable prior to this invention. It has been found that this problem can be overcome through use of the teaching of this invention.

Referring to FIG. 5, a means is schematically shown for manufacturing a fabric having two distinctly different surface characteristics. A relatively thin web 21 of dry, mixed fibers 11 and 19 is first laid down, superimposing on the same is a loose weave fabric 22 such as a low count gauze, cotton scrim, or the like. A second relatively thin web 23 of dry fibers 11 and 19 is then deposited onto the loose weave fabric 22. The dry laminate so formed is suction-bonded, dried, and cured in the manner previously described. The laminate is then split into two fabrics 24 and 25, the laminate separating at the point of intersection of the loose weave fabric. The loose weave fabric 22 is removed and the fabrics 24 and 25 wound on separate rolls 26 and 27. Other methods of splitting may be employed with or without an actual dividing web 22.

By first forming and then splitting the web, fabrics having unique surface characteristics are formed including short fibers, the fabrics having excellent drape, loft and elongation characteristics. A section of fabric formed by the split web technique is illustrated in FIG. 6. The fabric is quite similar to that of FIG. 2 differing primarily in that the fibers 28, on the surface previously adjacent the loose weave fabric 22, have substantially more loft than the fibers on the other surface of the fabric. The apparatus of FIG. 5 is schematically illustrated

as in FIG. 1, 12' indicating fiber-laying equipment, 13' a moving belt, 14' a binder container and dispenser, 15' a suction box, and 16' heating and drying apparatus.

In some constructions, it is desirable to have even greater drapability than would result from the construction features already described. Increased drape can be attained without significant loss of loft, softness or strength by embossing the fabric after completion of the processes shown in FIGS. 1 and 5. This produces a fabric such as shown in FIG. 4 where the fibers 11 and 19 have been subjected to embossing pressure along the lines 20.

The fabrics so far described are not in and of themselves water absorbent as the bonding agent appears to sufficiently coat the individual fibers as to interfere with their normal water-absorbent characteristics. Absorbent fabrics can be made, however, by treating the fabric with a rewetting agent such, for example, as an anionic sulfonated alkyl ester. In the preferred practice of making the fabrics of the present invention, the rewetting agent is included in the impregnating solution or suspension together with the binder. By including the rewetting agent at this step in the manufacture of the fabrics, the same are found to be readily wettable and highly absorbent.

The preparation of fabrics of the present invention are further illustrated by the following examples. The examples are given for the purpose of illustration only, and the invention is not limited thereto.

EXAMPLE I

A fibrous web composed of approximately 15 percent textile-length fibers such as uniformly cut 1½ inch 1.5 denier rayon fibers and 85 percent fibers of individualized second cut cotton linters is made on a web laying device to a weight of 2 oz./yd.². This web is then conveyed into a bonder as heretofore described using a preferred bonding agent such as a self-crosslinking acrylic emulsion. The composition of the binder suspension and the amount of suction at the suction slot is controlled so as to give the fabric a dry solids add-on of 4.75 percent based on the fabric weight. The wet web is conveyed into a drying oven having a temperature of 310°-320° F. where it is dried and the resin binder cured. The resultant material has a density of 0.05 to 0.07 gram/c.c., a dry strength of about 1.4 pounds/inch of width in the machine direction and about 0.8 pound/inch of width in the cross direction. The wet strengths are about 0.9 pound/inch of width in the machine direction and about 0.5 pound/inch of width in the cross direction. The fabric has excellent hand or feel and drape.

EXAMPLE II

A fibrous web composed of approximately 25 percent textile-length fibers such as uniform 1.5 denier 1 inch rayon fibers and 75 percent fibers of ground up douglas fir beleached kraft pulp is made on a web laying device to a weight of 1.5 to 2 oz. per square yard. The web is then conveyed into a section bonder heretofore described using the bonding agent HYCAR 2600 × 120. The composition of the binder suspension and the amount of suction at the suction slot is controlled to give the fabric a dry solids add-on of about 25 percent based on the fiber weight. The wet web is conveyed into a drying oven having a temperature of 310°-320° F. where it is dried and the resin binder cured. The resultant web has a density of 0.08 gram/c.c.; a dry strength of about 7 pounds per inch of width and a wet strength of about 2.2 pounds per inch of width in the machine direction.

EXAMPLE III

A fibrous web composed of approximately 10 percent textile-length fibers such as uniform 1.5 denier 1½ inches rayon fibers and 90 percent douglas fir pulp is made to a weight of 1.5 oz./yd.². The web is then passed through a section bonder and receives thorough impregnation with HYCAR 2600 × 120. The composition and viscosity of the binder suspension and amount of suction are controlled to give the fabric a dry solids add-on of about 1 percent based on the fiber weight.

The wet web is conveyed into a drying oven having a temperature of 310° to 320° F. where it is dried and the resin cured. The resultant fabric has a density of 0.06 gram/c.c., a dry tensile strength of 0.18 pound/inch in the machine direction and 0.13 pound/inch in the cross direction, and the bonded fabric shows an elongation of 50 percent before separation.

EXAMPLE IV

A fibrous web composed of approximately 13 percent textile-length fibers such as uniform 1.5 denier 1½ inches rayon fibers and 87 percent douglas fir pulp is made to a weight of 8 oz./yd.². The web is then passed through a suction bonder and receives thorough impregnation with HYCAR 2600 × 120. The composition and viscosity of the binder suspension and amount of suction are controlled to give the fabric a dry solids add-on of about 1.5 percent based on the fiber weight.

The wet web is conveyed into a drying oven having a temperature of 310° to 320° F. where it is dried and the resin cured. The resultant fabric has a density of 0.09 gram/c.c., a dry tensile strength of 1.9 pounds/inch in the machine direction and 1.4 pounds/inch in the cross direction, and the bonded fabric shows an elongation of 70 percent before separation.

EXAMPLE V

A fibrous web composed of approximately 5 percent textile-length fibers such as uniform 1.5 denier 1½ inches rayon fibers and 95 percent douglas fir pulp is made to a weight of 2.3 oz./yd.². The web is then passed through a suction bonder and receives thorough impregnation with HYCAR 2600 × 120. The composition and viscosity of the binder suspension and amount of suction are controlled to give the fabric a dry solids add-on of about 2 percent based on the fiber weight.

The wet web is conveyed into a drying oven having a temperature of 310° to 320° F. where it is dried and the resin cured. The resultant fabric has a density of 0.07 gram/c.c., a dry tensile strength of 0.56 pound/inch in the machine direction and 0.40 pound/inch in the cross direction, and the bonded fabric shows an elongation of 46 percent before separation.

The fabrics described above have been utilized as cosmetic pads, lithographic wipes, operating room towels and diapers. The excellent hand, feel and drape qualities of the fabrics give diapers made therefrom much the same feel and handling qualities as diapers formed of woven fabrics. However, the use of the short textile fibers, such as wood pulp and cotton linters, permits the same to be manufactured at a price substantially below that of woven fabrics or the conventional nonwoven fabrics thus keeping the cost of the final diaper well within a price such that the same can be disposed of after use.

A diaper of simple inexpensive construction using a fabric of the present invention is illustrated, for example, in FIGS. 7, 8 and 9. The diaper is formed of a top fabric sheet 29 and a bottom fabric sheet 30, the fabric sheets 29 and 30 being made in accordance with the present invention in the manner previously described. Between fabric sheets 29 and 30 is an absorbent pad 31 formed of wood pulp, or other highly absorbent material. The absorbent pad 31 is substantially narrower in width than the top and bottom fabric sheets 29 and 30 and is spaced from the edges of sheets 29 and 30 to lie along the center portion of the diaper, i.e., the portion which would, in use, be positioned at the crotch of the infant. The bottom fabric sheet 30 may be longer than the top fabric sheet 29, the extending ends 32 and 33 being folded over to form reinforced areas 34 and 35 for receiving safety pins and the like when applying the diaper. However, if desired, the top and bottom sheets may be of substantially the same length and a strip of gauze or other woven fabric inserted between the two sheets at each end to reinforce the diaper in these areas.

In forming the diaper, both the top fabric sheet 29 and the bottom fabric sheet 30 may be formed of an absorbent fabric, i.e., one which contains a rewetting agent, or the diaper may be formed with only the top fabric 29 and the absorbent filler 31 being absorbent while the bottom fabric 30 is nonabsorbent, the same having been prepared in the manner described without being rendered absorbent through the inclusion of a rewetting agent.

Where the fabrics 29 and 30 of the diaper are made through the split web technique heretofore described, the side of each fabric sheet which was in the inner portion of the web prior to splitting has appreciably more fiber loft than the other side of the fabric. This loft is quite beneficial in forming a several ply construction such as the diaper construction just described. The loft sides of the fabrics are placed in face-to-face contact with each other on either side of the filler or absorbent pad 31. The loft fibers tend to interlock when the surfaces are pressed together. The fabrics 29 and 30 are thus mechanically united along their edges on each side of the absorbent pad 31 to give the appearance and feel of a single fabric. This also prevents the absorbent pad 31 from shifting its position. The side edges 36 and 37 of the diaper may or may not be further secured through spot bonding along the edge to prevent an initial separation of the fabrics 29 and 30 along such edges if desired.

As the fibers of fabrics 29 and 30 are through bonded, there is no problem with fraying edges and the like so that hems or other structure for prevention of edges fraying is not necessary. Because of its simple construction, the whole diaper can be assembled relatively easily.

In order to improve the ease with which the diaper is applied, the portions extending along each side of absorbent pad 31 are folded in towards the center of the diaper and then back on themselves to form two double folds 38 and 39, one along each side of the diaper. This is illustrated in FIG. 9. The double fold along each side is stabilized by adhesive 40 and 41 being applied near the center portion of each double fold as measured from the diaper ends. This may either be a permanent or temporary adhesive as the primary purpose of the adhesive is to hold the center portion of the folds in place while the end portions of the folds are opened in applying the diaper.

Particular embodiments of the invention have been used to illustrate the same. The invention, however, is not limited to these specific embodiments. In view of the foregoing disclosure, variations or modifications thereof will be apparent, and it is intended to include within the invention all such variations and modifications except as do not come within the scope of the appended claims.

What is claimed is:

1. A lofty and soft nonwoven, through bonded fabric comprising a machine laid web having a machine direction and a cross direction, said fabric consisting essentially of predominantly short fibers, a minor percentage of long fibers and a low viscosity, water dispersible binder applied throughout said fabric in an amount between about 1 percent and about 30 percent of the weight of the fibers on a dry solids basis, said short fibers comprising cellulosic fibers having lengths less than one-quarter inch, said cellulosic fibers comprising no less than about 75 percent by weight of the fiber content of said fabric, said long fibers comprising separated synthetic fibers having substantially uniform lengths greater than three-quarters inch, said synthetic fibers comprising no more than about 25 percent by weight of the fiber content of said fabric, said short fibers and said long fibers being substantially randomly disposed and distributed throughout said fabric, said fibers being interconnected by said binder to form a network, said web having a greater tensile strength in the machine direction in comparison to the tensile strength in the cross direction, said fabric having a weight of less than about 8 ounces per square yard and a density of about 0.15 to about 0.05 gram per cubic centimeter.

2. A nonwoven fabric of claim 1 in which said binder has a viscosity less than 5 centipoise.

3. A nonwoven fabric of claim 1 in which the long fibers are synthetic fibers of about 1.5 denier and the unbonded fabric has an elongation to separation in excess of 60 percent of its original length.

4. A nonwoven fabric of claim 1 containing long fibers in an amount within the range of about 2 and about 25 percent by weight of the total fiber content.

5. A nonwoven fabric of claim 4 wherein said long fibers are synthetic fibers, substantially all of which have lengths of at least 1 inch.

6. A nonwoven fabric of claim 5 wherein said long fibers are synthetic fibers of about 1½ inches in length.

7. A nonwoven fabric of claim 4 wherein said long fibers are substantially all synthetic fibers cut to a single predetermined length.

8. A nonwoven fabric of claim 1 in which the major portion of said cellulosic short fibers has a length within the range of about one-sixteenth to one-quarter inch.

9. A nonwoven fabric of claim 8 having on at least one surface embossing in the bonded fabric whereby the drape characteristics thereof are enhanced.

10. A nonwoven fabric of claim 1 wherein the binder is applied to and dried on the fibers without substantial compression thereof.

11. A nonwoven fabric of claim 8 in which the surface fibers on one side have substantially more loft than the surface fibers on the other side.

12. A nonwoven fabric of claim 8 in which the fibers are bonded together with a cured crosslinked acrylate copolymer in an amount within the range between about 1 and about 30 percent of the weight of the fibers on a dry solids basis.

13. A wettable absorbent nonwoven fabric of claim 1 in which said bonded fabric contains a rewetting agent.

14. A nonwoven fabric of claim 1 wherein said short fibers are wood pulp and said long fibers are cut rayon.

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